taking two photographs by X-rays on the same plate. Its position, including its depth, was worked out from the photograph by an elegant geometrical construction. He reduced the method to sufficient simplicity for its general use by surgeons, and it has proved of great value when the bullet is deeply and awkwardly placed. He used this method at Netley, where he served as expert adviser during his last long vacation. His offer to resume his work there during the coming Christmas vacation was accepted in a letter which reached his house shortly after his death.

His sincerity and loyalty, his ever-ready sympathy, and his faithful discharge of the many duties he gladly undertook, endeared him to his colleagues and to many generations of students, who were quick to recognise and to appreciate his worth. A man of strong convictions, and one who had the courage fearlessly to uphold them, he won the admiration even of those who differed from him. Within the University, and far beyond its precincts, he was rich in the friendship which attaches to characters such as his. He leaves a widow, who has shared with him the affection and esteem in which he was held, and two sons, who now hold commissions in the Army.

NOTES.

BY the death of Mr. Henry Eeles Dresser, from heart failure, at Cannes, on November 28, at the age of seventy-seven, ornithology has lost one of its most distinguished students. Attracted to the study of birds from his early boyhood, Mr. Dresser devoted the leisure hours which he could spare from the arduous duties of a city life to the elucidation of the avifauna of the Palæarctic region, and gave up his well-earned holidays to extensive travel in Europe, Asia, and America in prosecution of his favourite study. He made his first contribution to scientific literature in the pages of the *Ibis* in 1865, and for a period of almost fifty years he continued to write on ornithological subjects in that journal and in the Proceedings of the Zoological Society. His most noteworthy contributions to ornithology are, however, his "History of the Birds of Europe," in eight quarto volumes, 1871–81, followed by a supplementary volume in 1895–96; "A Monograph of the Meropidæ," 1884–86; "A Monograph of the Coraciidæ," 1893; "A Manual of Palæarctic Birds," 1902–3; and "The Eggs of the Birds of Europe," in two volumes, 1910. For the purposes of these monographs he gradually acquired a magnificent collection of the skins and eggs of Palæarctic birds, now in the Manchester Museum, each specimen in which is fully authenticated and adequately labelled. The care with which he attended to these matters has rendered his collection one of the most valuable in the country. His work is marked by thoroughness, rigid accuracy of description, and careful attention to detail, while the coloured plates, made mainly from drawings executed by Joseph Wolf and J. C. Keulemans, illustrating his monographs are among the most beautiful and accurate in ornithological literature. Ornithology is indeed the poorer by his death.

WE regret to announce that Dr. Robert Caird, of Messrs. Caird and Co., shipbuilders, Greenock, died suddenly of heart failure on December 1, in his sixty-fourth year. We are indebted to Prof. A. Gray for the following appreciation of his activities in scientific fields:—Dr. Caird was well known as an engineer and naval architect, and for many years had been recognised as one of the leading authorities on marine engineering and the construction of ships. After some time spent in America, at the works of the Pullman Car Company, he joined in 1888 the firm founded by his father (who in his day was a leading Clyde shipbuilder), and, with his brothers, Patrick and Arthur Caird, built nearly all the present vessels of the Peninsular and Oriental Company's fleet, and many other great liners. From 1899 to 1901 Dr. Caird was president of the Institution of Engineers and Shipbuilders in Scotland, and he was also a fellow of the Royal Society of Edinburgh. In 1900 the University of Glasgow conferred on him the honorary degree of doctor of laws for his services to applied science. But it is perhaps not so widely known that Dr. Caird was keenly interested in pure science, especially applied dynamics, and did much in many ways to promote its progress. About thirteen years ago he entered *con amore* into the movement for the better equipment of the University of Glasgow; his firm gave a large subscription to the fund, and Dr. Caird himself took a very special interest in the foundation and equipment of the splendid new Natural Philosophy Institute, which was one of the results of the movement. To every detail of that building he gave the most careful attention, and the Natural Philosophy Department owes much to his practical interest and generosity. He had previously been an active member of the committee of Clyde engineers, to whom the University is indebted for the erection and equipment of the James Watt Engineering Laboratories.

MR. C. J. WOLLASTON, who died recently at ninety-five years of age, was not personally well known among the younger generation of present-day telegraph engineers, for he retired from active work fifteen years ago with a well-merited recognition of his services in the introduction of submarine telegraphy. His name, however, will go down to posterity as that of a member of the small company to which was transferred the concession granted by Louis Napoleon for laying a telegraph line under the English Channel. He was one of the engineers in charge of the operations on the *Goliath*, which started on August 28, 1850, from Dover to lay the line thence to Cape Grisnez, and reached its destination in the evening, from which point messages were exchanged between England and France "under the strait and through it for the first time." The line consisted of a single gutta-percha covered wire 1/10 in. diameter coiled on a drum mounted amidships on the vessel, and weighing five tons. It was paid over a roller at the stern, and sunk to the bottom of the sea by means of leaden clamps. Within three days from being laid the line was destroyed, but the possibility of submarine telegraphy was established, and a more ambitious and successful attempt was made in the following year. The cable here consisted of gutta-percha covered wires protected by coated hemp yarn, and an outside covering of galvanised iron wire. The weight of this cable was about 200 tons, and the electrical testing was carried out by Mr. Wollaston. This work took place on October 31, 1851, and on November 13 of the following year the cable was opened for public use between England and France.

WE regret to announce the death, on December 3, at forty-seven years of age, of Dr. A. Vaughan, lecturer on geology in the University of Oxford.

THE death is announced at Ranchi, India, of Colonel F. J. Drury, of the Indian Medical Service, Bengal. He was Inspector-General of the Civil Hospitals of Bihar and Orissa, and formerly professor of pathology at the Medical College, Calcutta.

THE death has occurred, in his sixty-eighth year, of Dr. M. A. Veeder, of Lyons, N.Y., who wrote largely on water supply and other questions relating to public health. He also made a study of the relation of pack ice in the great lakes of North America to the Glacial period, and carried out an extensive investigation of electromagnetic phenomena of solar origin, especially with reference to the causation of the aurora.

DR. GEORGE STERNBERG died on November 3, in his seventy-eighth year. He graduated at the College of Physicians and Surgeons, Columbia University, in 1860, entered the United States Army as assistant-surgeon in 1861, and retired with the rank of Brigadier-General in 1902. He served throughout the Civil War, and was in charge of the American Medical Service in the war with Spain in 1898. Dr. Sternberg had a special knowledge of cholera and yellow fever, and the Yellow Fever Commission of 1900 was appointed on his initiative, and practically solved the mode of transference by the mosquito. He founded the U.S. Army Medical School at Washington, and was the author of two large manuals of bacteriology, a treatise on malaria, a book on photomicrography, and a work on immunity, serum therapy, and protective inoculation, as well as many Government reports.

MR. GEORGE SMITH, who died on November 19, at the age of sixty-four, was one of the oldest and most experienced chemists and works managers in the employ of Nobel's Explosives Company, Limited, Glasgow. Born at Woolwich, he went through the School of Mines, and after some experience at the Woolwich Arsenal Laboratory, and at the Stowmarket Works of the New Explosives Company, he entered the services of Nobel's Explosives Company in 1879, as the works manager of their Westquarter Factory in Stirlingshire, where detonators and sulphuric acid were produced. During his capable management the factory grew in size and importance, other manufactures were added, and when Westquarter was no longer able to satisfy the demands placed on it a new factory was built at Linlithgow for powder fuse. Mr. Smith retired from active work in 1913, and lived afterwards at Hastings and St. Leonards. He was a fellow of the Royal Society of Edinburgh and of the Institute of Chemistry, and took out various patents during his active life. His numerous friends will long remember him and mourn his loss.

THE following are among the lecture arrangements at the Royal Institution before Easter:—Prof. H. H. Turner, a course of six illustrated lectures, adapted to a juvenile auditory, on "Wireless Messages from the Stars"; Prof. C. S. Sherrington, six lectures on the physiology of anger and fear, and nerve tone and posture; Dr. E. J. Russell, two lectures on the plant and the soil; Prof. A. Keith, two lectures on sea power as a factor in the evolution of modern races; Prof. F. Keeble, three lectures on modern horticulture; Prof. W. A. Bone, three lectures on utilisation of energy from coal; Sir F. Watson Dyson, Astronomer Royal, on measurement of the brightness of stars; Prof. L. W. King, two lectures on recent excavations in Mesopotamia; Prof. H. E. Armstrong, two lectures on organic chemistry in war; Sir J. J. Thomson, six lectures on radiation from atoms and electrons. The Friday evening meetings will commence on January 21, when Sir James Dewar will deliver a discourse on problems in capillarity. Succeeding discourses will be given by Prof. L. Hill, Prof. W. Bateson, Prof. E. G. Coker, Prof. S. P. Thompson, Sir Napier Shaw, Dr. A. Strahan, Prof. W. M. Bayliss, Prof. A. Fowler, and Sir J. J. Thomson.

THE theory that the possession of territory, and the struggle which this involves, was a factor in sexual selection was first definitely formulated by Mr. H. Eliot Howard, in his remarkable book on "The British Warblers." The soundness of this view is now attested by Mr. J. M. Dewar in his studies on the oyster-catcher in relation to its natural environment. In the *Zoologist* for November he goes still further, and holds that the "law should be extended to apply to the birds in winter, as they then have territories, though no opportunity has come under notice of a territory needing to be defended against intruders." Howard's view that the possession of territories is a biological advantage, both to the individual and to the species, by securing an adequate, and no more than an adequate, supply of food, is borne out by the general evidence derived from the areas under observation in regard to the oyster-catcher.

IN an article entitled "Reactions to the Cessation of Stimuli" (*Psychological Review,* vol. xxii., No. 6), Mr. H. Woodrow describes some experiments which show that the reaction to the cessation of a sound or light stimulus is in all cases the same as the reaction time to the beginning of that stimulus, and that the lengthening in reaction time due to a decrease in intensity of stimulus is equal in amount, and follows the same law, in the case of both beginning and cessation reactions. The author, in attempting to find an adequate hypothesis which shall subsume these facts, criticises both the latent period view and synaptic resistance, and develops his theory of the central nervous system as the seat of a complex system of inter-related activities and potential energies, which is disturbed throughout by any change in any part of the system. The physiological disturbance in this case is in part the process of becoming aware of a stimulus or of attending to it. A small change in excitation disturbs the pre-existing cortical system so as to bring about the reaction time more slowly than does a large one, not because of the resistance to its conduction, but because of the inertia of the pre-existing central system. Physiologists and psychologists will find the article interesting and controversial.

IN the *Philippine Journal of Science,* vol. x., No. 5, for September, 1915, Mr. E. D. Merrill continues his descriptions of new or noteworthy plants from the Philippines. This instalment, which is No. xii. of the series, includes seven genera credited for the first time to the Archipelago, viz., Avena, Polytoca, Angelesia, Glyptopetalum, Ochrocarpus, Asystasia, and Polytrema. Sixty-two new species are described belonging to various families, and in all eighty species are added to the Philippine flora. The Avena is, no doubt, an introduced plant.

THE cultivation of sisal hemp and its preparation forms the subject of an article in the Bulletin of the Imperial Institute, vol. xiii., No. 3. From Mexico, the home of the plant, it has been widely distributed, and is now being successfully grown in British East Africa and in the Bahamas has long been introduced. The article deals especially with the history of the introduction of the plant into various countries and the preparation of the fibre for market, where its chief use is in the making of twine. It is pointed out that for a successful enterprise large areas must be planted, especially if a factory is to be erected. Details with figures are given of British machinery for the preparation of the fibre.

THE annual report of the Department of Agriculture, Uganda, for the year ending March 31, 1915, is a record of useful and steady progress. An interesting account of coffee cultivation is given, from which it is seen that the coffee-leaf disease (*Hemileia vastatrix*) is on the wane, and does not appear to be seriously affecting the coffee plantations in the country. A chart is given showing the fluctuations in the amount of the disease compared with rainfall and humidity on the Government plantation, Kampala, but the outstanding feature of the chart is that the disease reaches its maximum during the months July to September. Other fungus parasites are dealt with in the report of the Botanist, but there does not appear to be any serious disease affecting the economic products in Uganda.

THE ninety-third Report of the Commissioners of Woods, Forests, and Land Revenues, dated June 29, is mainly concerned with the financial state for the year of the Crown properties under their charge. These are multifarious in kind, including, in addition to land let for buildings, foreshores, mineral rights, etc., 346,935 acres, of which 69,103 acres are under the growth of timber. The main centre of active forestry operations is the Dean Forest and Highmeadow Woods in Gloucestershire, which are about to be used as a forestry demonstration area. The old school for the training of woodmen at Parkend has been extended to include more men under instruction; and a new School for Forest Students is now being erected near Speech House. The wood distillation works, which were opened in October, 1913, have proved successful. Large quantities of charcoal and fuel-wood from the various Crown forests were dispatched to the trenches in Flanders. Increased quantities of pit-wood have been sold from Dean Forest and Tintern Woods. The Crown holds in England 73,375 acres of agricultural estates, consisting mainly of farms varying from 50 to 1000 acres in extent; but 9,374 acres are now let for small holdings and allotments. The greater part of the latter have been created in the past nine years, during which period eighty-seven new cottages and seventy new sets of farm buildings were erected, whilst existing cottages and homesteads were altered and improved.

ACCORDING to the Bulletin of Economic and Social Intelligence issued by the International Institute of Agriculture, the co-operative movement is very successful in Finland, where 10 per cent. of the whole population are members of such societies; this proportion, in fact, is only surpassed by Denmark, where the corresponding figure is 25 per cent. An unusual organisation of the kind is that established for the working of peat moors. The use of peat litter in retaining the most valuable constituents of manure is generally recognised, and since Finland is very rich in peat deposits, their working in the interests of agriculture has developed greatly. The co-operative society buys a moor, or acquires the right of extracting peat, constructs the necessary drying sheds, and then sells the peat to its members. Some of these societies are very large, owning plant to the value of 4000*l.*, and exporting their peat abroad.

A THIRD article on the economic resources of the German colonies, dealing this time with those in West Africa, is published in the new number of the Bulletin of the Imperial Institute. The Cameroons, the chief peak of which rises to 13,000 feet, export rubber, palm kernels, cacao, and palm oil especially, and also to a smaller extent gum arabic, kola, and shea nuts. Some attention has been devoted to the cultivation of tobacco with considerable prospects of success. Stockbreeding, as in other German colonies, has been well developed, despite the difficulties caused by tsetse fly. Much of the territory is unexplored, but so far no minerals of particular economic importance are known. It may be added that so far as the flora is concerned, the region is remarkably interesting. Togoland exports oil palm products, maize, rubber, and cacao, and cotton, copra, ground nuts, and kapok are among the minor articles of export. A good deal of attention has also been paid to forestry, with promising results. Iron ores occur abundantly, and good limestone is also found, but lack of transport facilities has prevented the establishment of any definite iron-ore industry.

THE recently received second number of the fifth volume of the *Journal of Agricultural Research,* published by the Department of Agriculture in Washington, contains two interesting phytopathological papers by Mr. I. E. Melhus. In the first of these it is pointed out that the possession of perennial mycelium, hibernating in the tissues of their respective host-plants, is a characteristic feature of many species of parasitic fungi belonging to the family Peronosporaceæ, of which perhaps the most widely known is the potato-blight fungus, *Phytophthora infestans.* A list of fifteen species is given in which this hibernation occurs, the necessary evidence being supplied by the author himself for four of them. In the second paper evidence is adduced to show that the source from which the potato-blight originates each season is to be found in aerial shoots of the potato, which become infected with the mycelium of the fungus direct from the diseased tuber. From nearly a thousand diseased tubers specially planted during the seasons of 1913 and 1914 five cases arose where one or more diseased, spore-bearing shoots were produced, and four of them served as centres from which the blight spread to neighbouring, healthy plants. That this might occur was shown by de Bary over half a century ago, but, although confirmed later by Jensen, it cannot be said that this view of the mode of infection of the crop has met with universal acceptance. Mr. Melhus's work, therefore—carried out under field conditions—provides a further and substantial measure of support for the original view propounded by de Bary.

IN the annual report of the Smithsonian Institution for 1914, Mr. E. N. Marais has an account of the drought in Watersberg, South Africa. The name was originally given as expressive of the fertility of that part of the Transvaal. To-day it is practically a desert with dried-up watercourses, dead orange groves, and desolate pasture lands. The game, once very plentiful, has almost all left the district, and little animal life remains. Only the numerous thermal springs remain unaffected, and on these the few inhabitants depend for drinking water and for irrigation.

THE pastoral and agricultural possibilities of Central Australia have been a good deal discussed in recent years. Attention was directed to them at last year's Australian meeting of the British Association. The probable value of the region to the north-east of Kalgoorlie and Laverton is indicated in a paper by Mr. A. C. Macdonald in the *Victorian Geographical Journal* (vol. xxxi., part ii.). Mr. Macdonald brings together evidence from explorers and others to show that the rainfall, though most irregular, is by no means absent, but that the soil would be most productive under a proper system of irrigation. This, he contends, would be feasible, since artesian water in quantities has been proved to exist near the surface. There is every indication that this water is quite suitable for irrigation, and is not heavily charged with alkali.

THE United States Geological Survey is publishing a series of four geographical handbooks for travellers, each book covering one of the chief railway routes west of the Mississippi. The second one deals with the Union Pacific route from Omaha to San Francisco (Bulletin 612, The Overland Route, price 1 dollar). The idea is excellent, and is admirably carried out. Much geographical information otherwise difficult of access is collected, and many historical details are added. The illustrations are good, but the chief feature of the volume is the series of twenty-five contour maps on a scale of 1 to 500,000. They are clear and well printed, and free from crowding of detail, yet contain all that a traveller could desire. Each map is conveniently placed for reference from the text. The book has much value even for those who do not contemplate going the journey.

THE Canadian Department of Mines has issued a very interesting monograph (Memoir No. 78) on the Wabana iron ore of Newfoundland, by Mr. A. O. Hayes. These famous iron-ore deposits form a number of beds, which outcrop for about three miles along the northern shore of Bell Island, Conception Bay, and dip to the north-west under the waters of the bay. These beds form part of an extensive series of Ordovician sedimentary deposits, mainly of sandstones and shales, comprising the higher beds of the northern limb of a somewhat flat anticline. The upper 1000 ft. of this series contain a number of ferriferous beds, two of which, known as the "Dominion Bed" and the "Scotia Bed," are of workable thickness, the former averaging about 10 ft. and the latter, the upper one, about 8 ft., though thicknesses up to 30 ft. have been met with. The total quantity of iron ore is estimated at more than 3000 millions of tons. The ores consist mainly of red hæmatite, together with chamosite (aluminous ferrous silicate), and siderite. The ore is oolitic in structure, the spherules consisting generally of alternate concentric layers of the two first-named minerals, though some consist wholly of hæmatite. Fragments of fossil shells occur throughout the ore, and it is to their presence that the phosphoric acid in the ore (usually 1·5 to 2·5 per cent.) is due. The author considers these ores to be primary deposits formed in shallow seas, and holds that "the iron was derived by long-continued weathering of earlier crystalline and sedimentary rocks, the solution of their iron content by mineral and vegetable acids and subsequent transportation of the iron salts by streams into the sea." He holds that the evidence is against the probability of these ores having been formed by the metasomasis of an original oolitic limestone.

THE rainfall over the British Isles for October is dealt with in *Symons's Meteorological Magazine* for November, and the rainfall table gives the tentative results of the British Rainfall Organisation prior to the publication of fuller details in the rainfall volume for 1915. There were only three stations in Great Britain with an excess of rain—Rousdon having 190 per cent. of the average, Stroud 121 per cent., and Braemar 103 per cent. Arncliffe, in Yorkshire, had only 21 per cent. of the average rainfall, and was relatively the driest place in the kingdom; Seathwaite had 26 per cent. of the average, and Hull 31 per cent., whilst other places had more than 33 per cent. The greater part of Ireland was wet, but the fall at Omagh was only 82 per cent. of the average, while it was as high as 179 per cent. at Waterford, and 155 per cent. at Gorey, Wexford. Less than one-half of the average rainfall for the month is said to have fallen over the west and north-west of Scotland and over the northern half of England and Wales. The map for the Thames Valley shows a considerable range in the rainfall, the measurement for the month amounting to 7 in. in the south-west, whilst it was less than 2 in. in the north-east and in part of the upper Thames.

IN an address to the American Institute of Electrical Engineers in February last Dr. Rosa, chief physicist at the Bureau of Standards, gave an account of the work done by the bureau, with special reference to the electrical part of the work. The address is reproduced in the November number of the Journal of the Franklin Institute, and from it we learn that a new electrical building, 190 ft. by 60 ft., and five stories high, has just been completed at a cost of 40,000*l.*, and that a similar building is about to be erected for the chemical division. When this is complete the United States Government will have spent 400,000*l.* on the bureau and its equipment. So far as the electrical division is concerned, the work is subdivided into eleven sections as follows:—Resistance and electromotive force; inductance and capacity; commercial measuring instruments; magnetic measurements; photometry; wireless telegraphy; electric railway work; electric lighting and power; safety rules, regulations, and devices; gas supply; telephone service.

MR. C. P. SPARKS, who has succeeded Sir John Snell as president of the Institution of Electrical Engineers, delivered his inaugural address on November 18. He dealt chiefly with the development of the electricity supply industry, and, in the last part of his address, suggested the directions in which further progress might be anticipated. These, he thought, would largely be governed by the necessity for fuel economy, and he put forward the proposition that the economical use of coal had been hindered in this country by its low price. One of the next steps to lower the cost of production will be the gas-firing of boilers, the gas being obtained from producers worked at low temperature so as to provide by-products from the distillation of coal as a raw material for other industries. As the by-product processes can only be worked with real success on a large scale, this will have to be preceded by a fairly thorough centralisation of electricity supply stations, so that the outputs of the numerous small electricity works will gradually be merged into a few large generating stations of sufficient size to work with the utmost economy. The necessity for fuel economy will also result in the more complete displacement of gas lighting by electric lighting. With electricity generated in modern power-houses, and ordinary metal filament lamps, 750,000 candle-power-hours are generated per ton of coal, compared with 260,000 c.p. per ton of coal when gas and modern gas mantles are used. The extended use of so-called "half-watt" lamps will soon double this 750,000, so that it would require an improvement in gas mantles quite beyond the range of immediate probabilities to equalise matters.

SCIENTIFIC societies and journals which deal with certain special subjects do not appear to have suffered much by the war. This does not mean that those engaged in scientific work have held back from taking their places with the fighting forces; indeed, the rolls of honour of the universities show that exactly the reverse is the case. It may be due partly to the fact that many workers in science are past the military age, and partly also to the diminished number of students, leaving more time for research to those most qualified to carry it out. In certain directions there is even an expansion noticeable in the scope of the subjects dealt with, and we congratulate the editors of the *Archives of the Röntgen Ray* upon their choice of a new and wider title for that important publication. It is the only English periodical dealing with the subject of X-rays in all its bearings, and it naturally embraces radio-activity, in addition to matters concerning the applications of radiations generally as well as electricity to medical purposes. We note that the new title is *Archives of Radiology and Electrotherapy*, so that as broad a field as possible may be covered; and to judge by the issues since this change was made last June there is every reason to expect that this publication will meet with the success it deserves. To the publisher, Mr. W. Heinemann, great credit is due, especially for the excellence of the reproductions of radiographs. Each part is well and fully illustrated, and contains a valuable collection of data relating to cases of some special interest.

Engineering for December 3 contains the concluding article of a descriptive account of the machinery of the motor-ship *Kangaroo*, constructed by Messrs. Burmeister and Wain, Glasgow, and purchased by the Western Australian Government for carrying produce to Britain. The vessel is propelled by twin-screws, each driven by independent six-cylinder Diesel engines on the four-stroke cycle. Each cylinder has a diameter of 22·05 in., the stroke being 29·92 in.; the designed power for each set at 140 revs. per min. is 1125 indicated horse-power, making a total of 2250 indicated horse-power. Much care has been given in this ship to the general arrangement of the main engines and auxiliaries, and the whole design is noteworthy from this point of view. During the trials, at light draught, the full power was developed at 144 revs. per min., and the total consumption of oil-fuel for main and auxiliary engines was then 0·292 lb. per indicated horse-power per hour—a very creditable performance. The speed of the ship at light draught was 11·2 knots. Sir John H. Biles and Co. acted as naval architects for the owners.

M. MAX A. LAUBEUF, late chief constructor in the French Navy, read a paper on submarines at the International Engineering Congress, 1915, in San Francisco, a summary of which appears in *Engineering* for December 3. The present tendencies of the constitution of submarine flotillas appear to be (*a*) coastguard submarines of 350 to 500 tons surface displacement, well armed (*e.g.* two minor torpedo tubes and outer tubes or outer torpedo launching equipment), and having speeds of 14 to 16 knots on the surface, and 9 to 10 knots when submerged; (*b*) squadron submarines having a great displacement (say 1200 tons when submerged), high speed, say 23 knots surface speed and 15 knots submerged, and a powerful armament, say eight inner torpedo tubes and sixteen torpedoes on board. *Engineering* also reprints a paper on the submarine of to-morrow by Mr. L. Y. Spear, read at the Society of Naval Architects and

Marine Engineers in New York. Whatever may be the decision of the U.S.A. authorities as to the surface speed necessary, the author of this paper is firmly convinced of the relatively greater importance of the submerged qualities for this type of boat, and believes that battery capacity and submerged radius of action and speed should not be unduly sacrificed either in the interests of durability or first cost.

OUR ASTRONOMICAL COLUMN.

A New Comet.—According to a telegram received on December 5 from Prof. Strömgren, Copenhagen, a message from the Cape to the Astronomer Royal announces that a new comet was observed by Taylor on December 2 in a position "three minutes preceding sixteen minutes south of δ Orionis." It is stated to be moving slowly north, but no indication is given of its magnitude.

The Solar Rotation.—The detailed account of a valuable spectrographic determination of the latitude variation in velocity of the sun's rotation is presented by Mr. J. B. Hubrecht in a memoir forming part i. of vol. iii. of the Annals of the Solar Physics Observatory, Cambridge (see also Monthly Notices, R.A.S., No. 8). Four series of spectrograms were secured during the first fortnight of June, 1911, with the McClean solar instruments. Each series contained the material—forty-eight plates—from which velocity differences have been derived for pairs of plates taken in positions separated by 90° at intervals of 15° around the sun's limb. The region studied was $\lambda\,4300$–$\lambda\,4400$, under a dispersion in fourth order such that 1 A.U. = 1·13 mm. Attention may be directed to a point regarding the manipulation of the Zeiss comparator; the settings were made by simply pushing the slide, and the readings were taken to 0·0001 mm., with an average probable error per displacement of only 0·0004 mm.

The results obtained indicate that the velocities probably vary regularly according to wave-length, diminishing towards the red, due to some physical cause residing in the sun itself. The distribution of the velocities appears to be consistent with the requirements of Emden's theory of the constitution of the sun.

Galactic Co-ordinates.—The progress made of recent years in stellar astronomy has directed increasing attention to the employment of a natural system of co-ordinates in place of those based on the arbitrary, ever-changing geo-solar planes of reference. The fundamental plane of reference is obviously determined by the Milky Way, but there remains to be fixed the point of departure in longitude. Unfortunately, from analogy with the standard system choice of this initial point has fallen on the ascending node of the galaxy. Mr. R. T. A. Innes, in advocating the general introduction of secular co-ordinates, pointed out the great economy of effort they afford in connection with the study of the planetary motions, and proposes to fix the zero of galactic longitude by the apex of the sun's way, thus entirely eliminating the effect of precession. In Circular No. 29 of the Union Observatory, Mr. Innes supplies a convenient table for the conversion of equatorial into galactic co-ordinates. The table is calculated on the basis of Newcomb's position of the pole of the galaxy ($\alpha\,191{\cdot}1^\circ$, $\delta+26{\cdot}8^\circ$, and Campbell's determination of the solar apex ($\alpha\,270{\cdot}0$, $\delta+30{\cdot}0^\circ$), and contains the galactic equivalents of every 5° of declination and twenty minutes of right ascension, also galactic parallactic angles for converting north pole position angles into corresponding position angles referred to the north galactic pole.

A Martian Calendar.—In Report on Mars, No. 10, Prof. William H. Pickering gives what should prove a convenient calendar for the use of observers of the planet Mars. The Martian year is divided into 669 calendar days of 24h. 38m. 42·04s. each, the planet's sidereal day (*i.e.* time period of rotation) being 1m. 19·39s. shorter. Fifty-six days are allotted to the first nine "months," and one day less to each of the other three. The "week" of seven days is thus retained as a unit. The year commences at vernal equinox, Martian date, March 1 = terrestrial date, March 20. The same report also contains some remarks on the possibility of observing gemination of canals during the coming opposition, and concludes with a discussion of colouring of the markings.

THE CENTENARY OF THE SOCIÉTÉ HELVETIQUE DES SCIENCES NATURELLES.

The centenary of the Swiss Natural Science Society was celebrated on September 12–15. The meeting was a great success, and was marked by two touching ceremonies: the placing of a laurel crown before the monument of Henri Albert Gosse, the gifted apothecary of Geneva, who with Pastor Wyttenbach, of Berne, originated this great national society, and the inauguration of a monument to the Swiss naturalist Forel at Morges. Both these monuments consist of fine erratic blocks, with the head of the naturalist carved in the form of a medallion. One stands in the shady garden surrounding the University of Geneva; the other has been placed in one of the most exquisite spots on the banks of Lake Leman. But it is not in these grand stones that we must seek the record of the fame of those they commemorate. It is in the living society which has carried out the ideals and continued the work of its founders—a society of which Forel formed until three years ago a prominent member—that the glory of these simple lovers of Nature and of their country is to be found.

The primary idea in founding the society was patriotic; a secondary one, dependent on the success of the undertaking, was that the society would be visited by *savants* from all countries, and that it might prove itself a source of light the rays of which should spread over the whole scientific world. Both these ideas have been realised in the hundred years that have passed, but it is interesting that the centenary should fall at a moment when the former only could have any prominence.

There were no official delegates from foreign countries, and practically all the participators were Swiss. The author of the present account was the only member of the English scientific world at the meeting, but she and Prof. W. H. Young, whose absence in America alone prevented his giving personally the communication presented in his name, are accepted by the Genevese scientific circle as almost, if not quite, of them.

In these circumstances, and in view of certain superficial elements of discord between the French and German Swiss, which the war has brought under the eye of the public, the occasion was made one for a manifestation of patriotic feeling. The President of the Confederation was present, and gave a memorable and eloquent address to the society after the official banquet at the Parc des Eaux Vives, lately become the property of the town of Geneva. President Motta is a native of Italian Switzerland, a fact